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INVESTIGATION OF LATE-QUATERNARY SEDIMENTS FROM THE SOUTH YELLOW SEA AND THE YANGTZE RIVER DELTA

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Abstract

The results of a study to determine the geochemical, mineralogical, magnetic and textural characteristics done on Late-Quaternary sediments from drill cores from the South Yellow Sea (core H106) and the Yangtze River Delta (core LA) (China) are reported. The Late-Pleistocene continental sedimentation is represented by clayey silt and hard clay layers, while the marine Holocene sediments consist mainly of clay (H106) and sand and clay layers (LA).

Introduction

Reported here are the results of a mineralogical, geochemical, paleomagnetic and textural investigation carried out with the purpose of characterizing Late-Quaternary sediments from two different depositional environments: the South Yellow Sea and the Yangtze River Delta.

The imprinting of the climatic conditions that characterised the Last Würmian phase are recognitiable in the overconsolidated clay layer that marks the Pleistocene/Holocene boundary.

Particle size distribution was determined using a Brinkmann Particle Size Analyzer (Model 2010). The mineralogy of bulk materials and their clay-size separates were determined by X-ray powder diffraction analysis (XRD).

South Yellow Sea, Core H106

Fifty-five clay and clayey silt samples representative of the last 20.000 years of sedimentation, were taken from a 600 cm-long core (H106), in 70 m of water (Figg. 1, 2).

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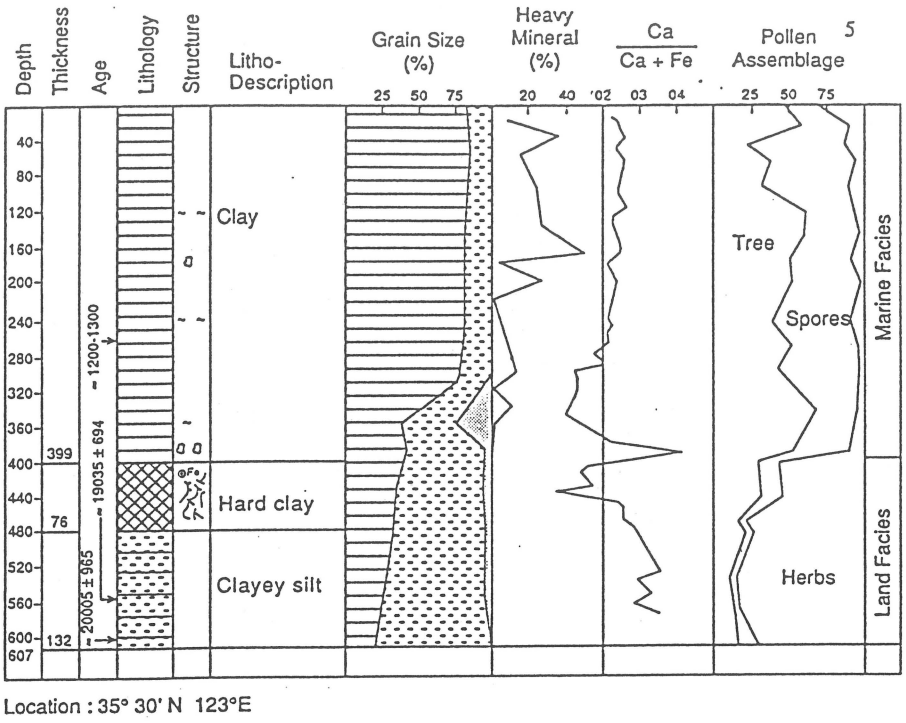

Fig. 1

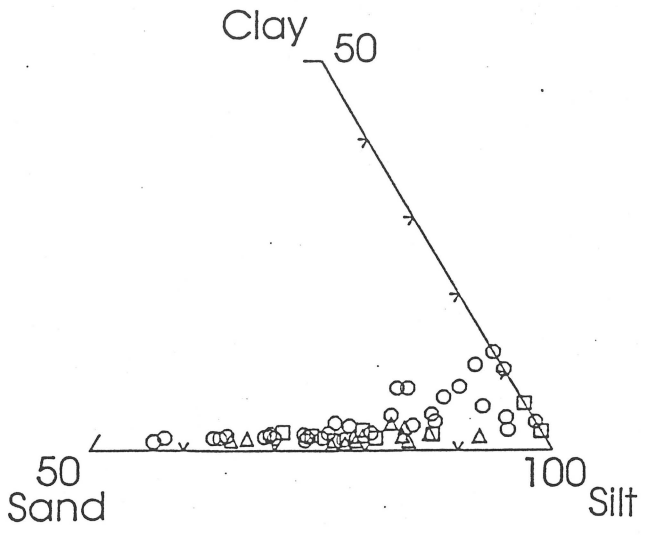

Fig. 2

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Detailed mineralogical analyses show that the samples are dominated by Quartz with subordinate Plagioclase, Chlorite and Mica (Muscovite/Biotite) and minor to trace amounts of K-Feldspar and Calcite (Fig.3).

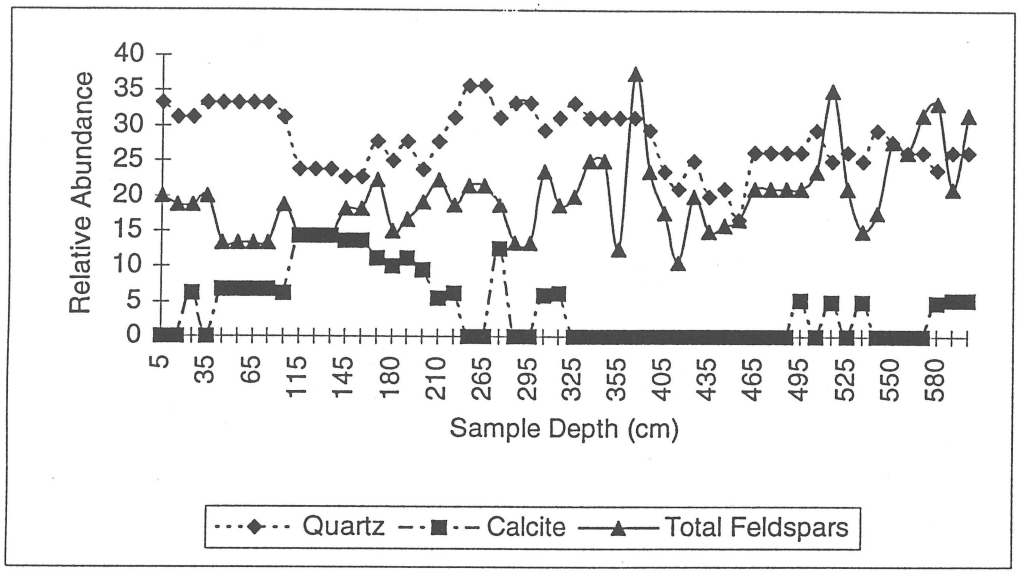

Fig. 3

Trace amounts of Smectite, Illite/Smectite mixed-layer mineral, Dolomite and Hornblende are also present and related to the magnetic (Fig. 4).

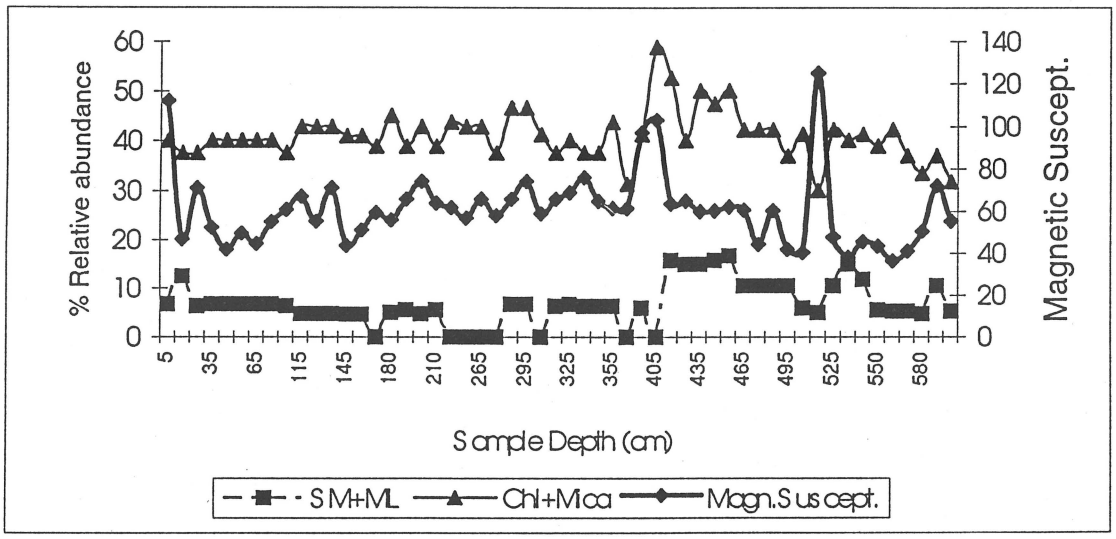

Fig. 4

In bulk samples, Calcite is more abundant from top of the core down to about 275 cm and is notably absent from 305 to 445 cm.

In the clay-size fraction, Calcite occurs in minor to trace amounts in most of the marine facies samples, is notably absent in the hard clay samples, and occurs in trace amounts in the lower continental unit samples.

The concentration of clay minerals Chlorite, Mica and Smectite is enhanced in the clay-size fraction. Chlorite and Mica occur in abundant to minor amounts in both units. Smectite is more abundant in the continental unit relative to the marine unit.

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The concentration of heavy minerals (see Fig. 1) decreases with depth within the marine unit. The change in concentration of heavy minerals in the upper vs. lower marine units suggests a change in provenance of the sediments. Provenance includes both the Yellow and Yangtze Rivers.

Yangtze River Delta, CORE LA1

Twenty-one samples were taken from Core LA1 30 m-long, in the Yangtze River Delta; stratigraphy and depositional environments are reported in Fig. 5.

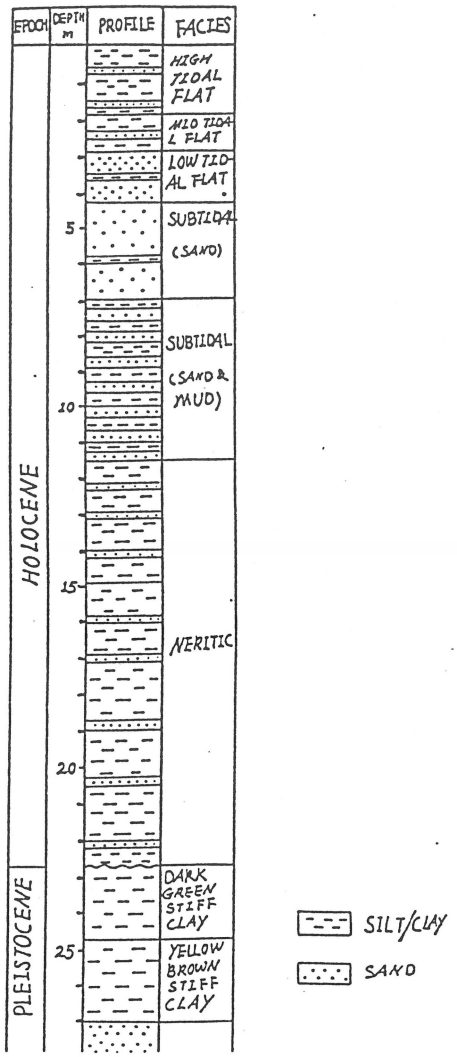

Fig. 5

The Late-Pleistocene "Stiff Clay" layer in the Yangtze Delta area is a paleosol (personal communication by Baozhu Liu, Tongji University, Shanghai), moreover it is considered as "meadow-soil-type".

The average relative persentage of the Silicates, for the bulk samples, is always higher than the Carbonates.The trend of the Silicates shows a constant high percentage for the continental samples, a constant low values for the neritic facies (base of Holocene transgression) and percentages that decrease from a high value in correspondance of the subtidal facies to a low value at the tidal flat sedimentation (Fig. 6).

Similarly, the relative abundance variation of the clay minerals for the clay-size fraction can be related to different paleoenvironmental depositions (Fig. 7).

The sand samples of the Upper Holocene sedimentation, from subtidal to low-, mid- and high tidal flats (Upper Holocene) show a mineralogical composition variation that, as for the clay sediments, may well be correlate to different depositional environments (Fig. 8).

The magnetic susceptibility variations, as indicated if Figg. 6, 7, 9, can be also correlated to mineralogical composition variations due to different facies.

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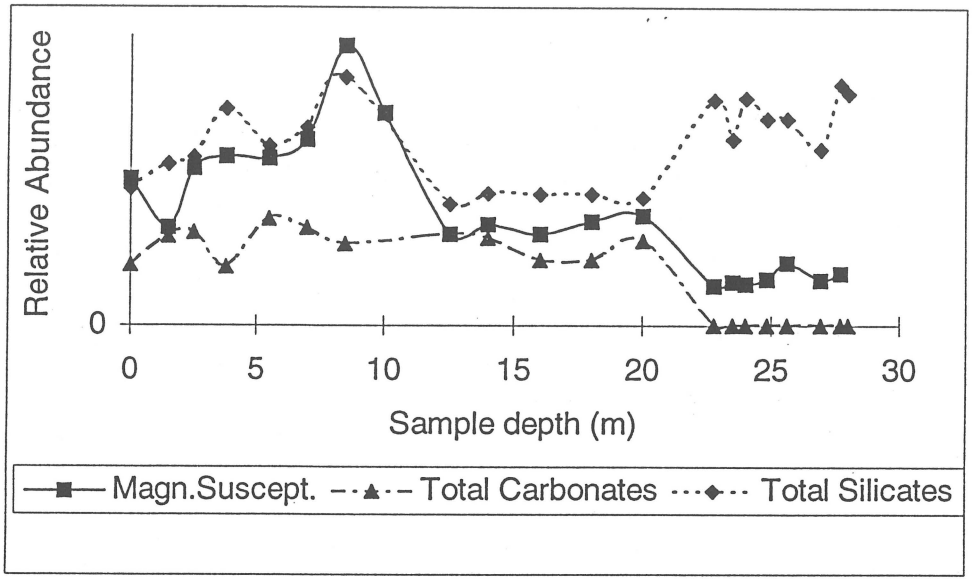

Fig. 6

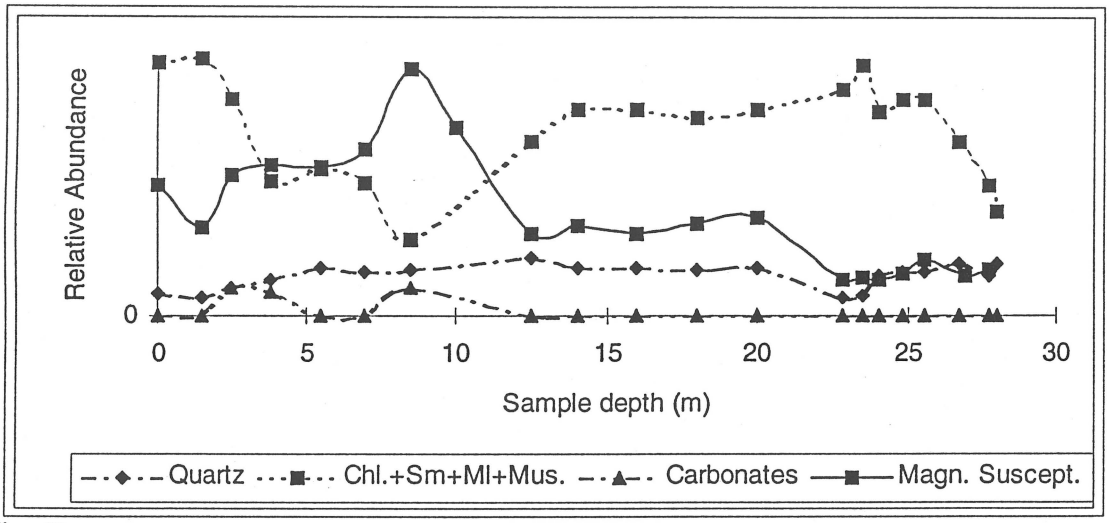

Fig. 7

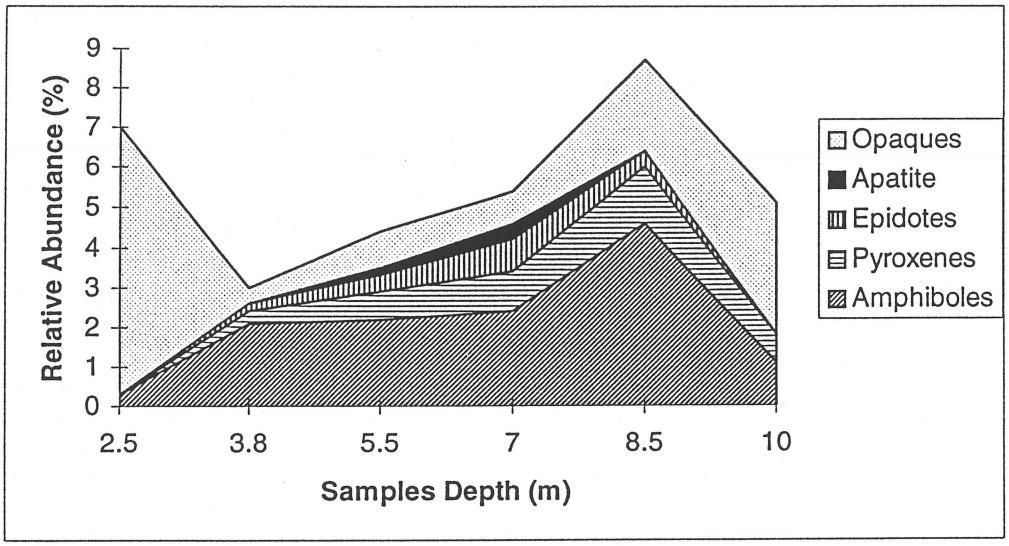

Fig. 8

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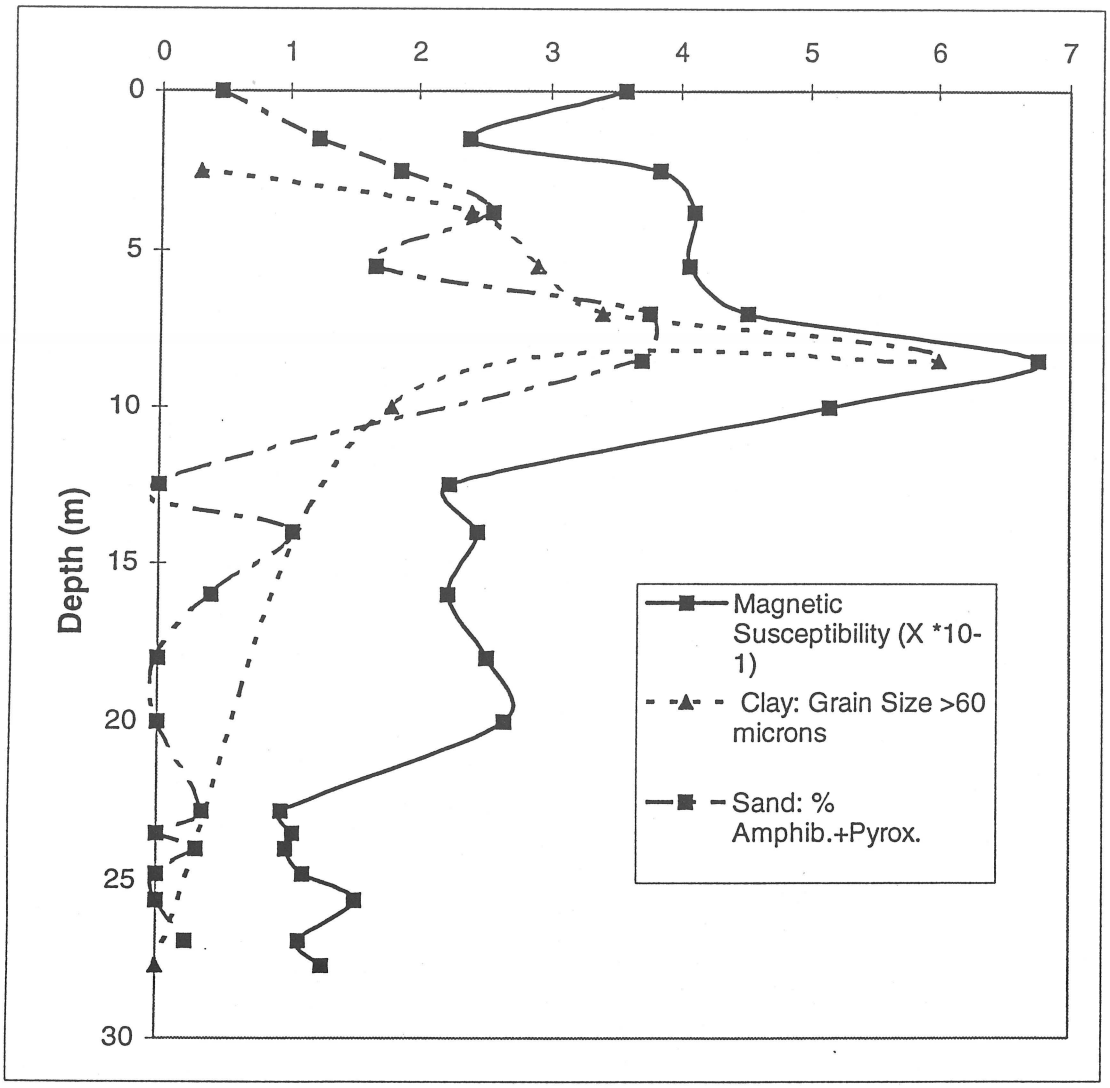

Fig. 9

Conclusions

The study has evidenciated the different mineralogical and sedimentological characteristics of Cores H106 and LA1, that can be attributed to source areas and depositional paleoenvironments differences.

Nevertheless, a detailed interpretation of the mineralogical composition variations for each of the two cores, indicates that these changes were related to the same paleoclimatic events.

The results obtained with this and similar studies (see references) has indicated that this analytical approach offers the possibilty to correlate in a regional scale global climatic events.

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